

### Amendments to the Claims

Please amend the claims without prejudice. The listing of claims will replace all prior versions, and listings, of claims in the application:

### Listing of the Claims

- 1- (Currently amended) A method for characterizing evaluating permeability of a formation with a logging tool positioned within a borehole surrounded by the formation, the method comprising:
  - exciting with the logging tool the formation with an acoustic wave propagating into the formation causing a seismic displacement of an electrolyte;
  - measuring with the logging tool a seismo-electromagnetic signal produced by the seismic displacement of the electrolyte acoustic wave within the formation;
  - exciting with the logging tool the formation with an electromagnetic exciting field causing the electrolyte to also be displaced;
  - measuring with the logging tool an electromagneto-seismic signal produced by the electromagnetic exciting field within the formation; and
  - analyzing the measured seismo-electromagnetic signal and the measured electromagneto-seismic signal to evaluate characterizing parameters the permeability of the formation.
- 2- (Canceled)
- 3- (Previously presented) The method of claim 1, further comprising:
  - measuring an acoustic response signal, the acoustic response signal being produced by the acoustic exciting;
  - estimating acoustic properties of the formation from the acoustic response signal;
  - measuring an electromagnetic response signal, the electromagnetic response signal being produced by the electromagnetic exciting;
  - estimating electromagnetic properties of the formation from the electromagnetic response signal.

- 4- (Previously presented) The method of claim 3, further comprising:
  - selecting initial values of inversion parameters;
  - synthesizing a synthesis seismo-electromagnetic signal and a synthesis electromagneto-seismic signal using the initial values of the inversion parameters;
  - calculating a first difference between the synthesis seismo-electromagnetic signal and the measured seismo-electromagnetic signal;
  - calculating a second difference between the synthesis electromagneto-seismic signal and the measured electromagneto-seismic signal;
  - adjusting the values of the inversion parameters according to the first difference and to the second difference;
  - repeating the synthesizing using the adjusted values of the inversion parameters, the calculating of the first difference, the calculating of the second difference and the adjusting until the first difference and the second difference respectively drop below a first predetermined threshold and a second predetermined threshold.
- 5- (Original) The method of claim 4, wherein :
  - the inversion parameters are an electrokinetic coupling coefficient and a mobility;
  - the synthesizing is simplified by synthesizing only a synthesis seismo-electromagnetic slow longitudinal signal and a synthesis electromagneto-seismic slow longitudinal signal from a mobility initial value and from an electrokinetic coupling coefficient initial value.
- 6- (Currently amended) The method according to claim 1, wherein the analyzing takes into consideration the propagating of the acoustic wave within the formation.
- 7- (Previously presented) The method according to claim 1, wherein the seismo-electromagnetic signal is a scismo-electric signal.
- 8- (Previously presented) The method according to claim 1, wherein the seismo-electromagnetic signal is a scismo-magnetic signal.
- 9- (Previously presented) The method according to claim 1, wherein the electromagneto-seismic signal is a magneto-seismic signal.

10- (Previously presented) The method according to claim 1, wherein the electromagneto-seismic signal is an electro-seismic signal.

11- (Previously presented) The method according to claim 1, further comprising:  
displacing the logging tool along the borehole so as to provide a continuous characterizing of the formation as a function of depth.

12- (Previously presented) A system for characterizing evaluating permeability of a formation surrounding a borehole, the system comprising:

a logging tool to be lowered into the borehole;

an acoustic emitter located onto the logging tool, the acoustic emitter allowing to excite the formation with an acoustic wave propagating within the formation causing a seismic displacement of an electrolyte;

an electromagnetic receiver to measure a seismo-electromagnetic signal produced by the seismic displacement of the electrolyte acoustic wave within the formation;

an electromagnetic emitter located onto the logging tool, the electromagnetic emitter allowing to excite the formation with an electromagnetic exciting field causing the electrolyte to also be displaced;

an acoustic receiver to measure a electromagneto-seismic signal produced by the electromagnetic exciting field within the formation;

processing means to analyze the measured seismo-electromagnetic signal and the measured electromagneto-seismic signal so as to evaluate characterizing parameters the permeability of the formation.

13- (Previously presented) The system of claim 12, wherein:

the electromagnetic receiver is an electric receiver allowing to measure a seismo-electric signal produced by the acoustic wave within the formation.

14- (Previously presented) The system of claim 12, wherein:

the electromagnetic receiver is a magnetic receiver allowing to measure a seismo-magnetic signal produced by the acoustic wave within the formation.

15- (Previously presented) The system of claim 12, wherein :

the electromagnetic emitter is an electric emitter allowing excite the formation with an electric exciting field.

16- (Previously presented) The system of claim 12, wherein :

the electromagnetic emitter is a magnetic emitter allowing excite the formation with a magnetic exciting field.

17- (Previously presented) The system of claim 12, further comprising:

at least one additional electromagnetic receiver;

at least one additional acoustic receiver.